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| **Study programme**: Master Professor in Mathematics (MP) | |

**Level**: master

**Course title:** Nonstandard mathematical problems (MP-04)

**Lecturers:** Siniša Đ. Crvenković, Boris B. Šobot

**Status**: elective

**ECTS**: 5

**Requirements**: none

**Learning objectives**: Practicing particular methodical procedures in presenting the selected topics in teaching mathematics.

**Learning outcomes:**
*Minimal:* Ability to understand basic problem types and their methodical transformations.
*Desirable:* A successful student will be able to apply the obtained knowledge and skills in additional work, such as preparations of talented pupils for mathematical competitions.

**Syllabus**
*Theoretical instruction:* Nonstandard problems of Euclidean geometry in plane and in space. Geometrical inequalities and extreme problems in geometry. Selected problems of combinatorial geometry. Inequalities. Mean inequalities and the Jensen inequality. Extreme values of functions and applications. Sequences and recurrent relations. Selected nonstandard problems in graph theory. Combinatorial games and games on graphs. Logical-combinatorial problems.
*Practical instruction*: Perfecting methodical procedures by applying the contents of theoretical part of the course in teaching practice.

**Literature**
1. B. Pavković, D. Veljan, *Elementarna matematika 1*, Tehnička knjiga, Zagreb, 1992.
2. B. Pavković, D. Veljan, *Elementarna matematika 2*, Školska knjiga, Zagreb, 1992.
3. R. Tošić, *Kombinatorika*, University of Novi Sad, 1999.
4. V.Petrović, *Teorija grafova*, University of Novi Sad, 1998.
5. D. S. Mitrinović, *Nejednakosti*, Građevinska knjiga, Beograd, 1965.

| **Weekly teaching load** | | | | Other: - |
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| Lectures: 2 | Exercises: 2 | Other forms of teaching:- | Student research: - | |

**Teaching methodology**
Theoretical lectures serve to recapitulate knowledge from elementary mathematics relevant to practice in schools. Practical lectures serve for analyzing problems appearing both in teaching practice and in advanced work with the talented children. Seminar work is aimed at students rehearsing methodical transformation by elaborating topics considered during the practical instructions. The final exam is oral and a student is supposed to demonstrate general understanding of the presented theoretical material and ability to present it adequately.

| Grading (maximum number of points 100) | | | |
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| **Pre-exam obligations** | points | **Final exam** | points |
| Activity during theoretical instructions | 5 | Seminar work | 50 |
| Activity during practical instructions | 5 | Oral exam | 50 |